

great thoughts and great actions. All are lit by the reflections of the infinite."

The translators are to be congratulated. Their task was by no means easy, but they have accomplished it in an eminently successful manner.

S. P. B.

History of Organic Chemistry.

Geschichte der organischen Chemie. Von Carl Graebe. Erster Band. Pp. x+406. (Berlin: Julius Springer, 1920.) England, 84 m.; Germany, 28 m.

THE history of a science has often been compared to the erection stone by stone of some great edifice; but it appears to the writer that the metaphor is ill chosen inasmuch as the complete building is already planned when the foundation is laid. A closer analogy is that of a jig-saw puzzle in which the separate, irregular bits are slowly fitted into their several places whilst the ultimate result remains hidden until the whole is complete.

This is certainly true of organic chemistry, and although the general plan seems to be taking shape in a marvellous fashion, who would declare the puzzle to be near completion or attempt to forecast its final development? Looking now at the ordered arrangement of its several parts it is difficult for some of us to realise the difficulties of the early investigators, who had to make a selection from an ever-increasing mass of disconnected observations and laboriously to piece them together. It is perhaps one of the remarkable facts in the history of organic chemistry that from the publication in 1832 of the classical research of Liebig and Wöhler on "the radical of benzoic acid," which Berzelius greeted as proclaiming the dawn of a new day, few revolutionary changes in fundamental principles have occurred to retard the steady growth of the science. Even the electrochemical theory, which engaged Berzelius and his opponents of the French and German laboratories in a somewhat embittered controversy, only served to stimulate research and add new facts to the science.

It is interesting to trace the many new theories which owe their inception to the study of organic chemistry. The theory of valency was developed by Frankland in studying the organo-metallic compounds; that of catalysis was formulated by Berzelius in explanation of the ether process. Isomerism was conceived by Faraday in examining the compressed hydrocarbon gases of the Portable Gas Co. The relation of vapour density to molecular weight elucidated by Gerhardt and Cannizzaro, the theory of atomic linking advanced by Kekulé and Couper; of stereoisomerism by Pasteur,

van't Hoff and Le Bel, and in recent years of dynamic isomerism, enzyme action, steric hindrance and many other phenomena, which have helped to throw new light on molecular mechanics and structure, all originated with this branch of the science.

In the volume before us, which is printed in clear type, Prof. Graebe describes in considerable detail and in simple and attractive language the history of organic chemistry from 1770 to the 'eighties of last century, and tells us that arrangements have already been completed with Dr. Hoesch to carry the story forward in a second volume. In the arrangement the author has recorded the results not only of experimental and theoretical investigations but has attempted to show by quotations from the original sources the manner in which the new ideas were given to the world, while numerous, brief biographies of chemists are introduced as their names happen to occur.

The volume has evidently been prepared with parental thought and care which the author expresses by the word *Vorliebe*, a feeling which can well be understood in one who, during a long and active career, has himself played no insignificant part in the story he relates. We can cordially recommend the book to all chemists who are interested in the history of their science.

J. B. C.

Early British Botanists.

Early British Botanists and Their Gardens, based on Unpublished Writings of Goodyer, Tradescant, and Others. By R. T. Gunther. Pp. viii+417. (Oxford: Printed by the University Press, 1922.) n.p.

JOHN GOODYER, until recently known only as the contributor of rare plants to Dr. Thomas Johnson, the editor of the second edition of Gerard's "Herball" in 1633, and further commemorated by Robert Brown's orchid genus *Goodyera*, is the central personality in this absorbing volume.

About twelve years ago Canon Vaughan, rector of Droxford, a Hampshire village famous as the retreat of Izaak Walton when he retired from London, printed an article embodying fresh information, which was followed later by a longer notice by Dr. G. C. Druce in the Report of the Botanical Exchange Club for 1916, pp. 523-550, drawn up from papers in the library of Magdalen College, Oxford. Now, thanks to the assiduity of the author of the volume under notice, he, as librarian, has had the scattered notes arranged and bound, and from them has presented a picture of the man, which is a revelation. He is shown

as an active and accurate botanist, a successful cultivator, and generous in imparting his treasures to his friends. For instance, Willem Boel, the Frieslander, gathered seeds in Andalusia for Goodyer, Coys, and Parkinson, which were distributed to friends; again, from one tuber of the Jerusalem artichoke from Franqueville he raised "a peck of rootes wherewith I stored Hampsheire" in 1617.

Upon the death of Johnson, in 1644, Goodyer was unquestionably the foremost botanist in the kingdom, and his life overlapped the first anonymous essay of John Ray, his Cambridge flora, in 1660; but he was dead six years before Ray's "Catalogus" saw the light in 1670.

In addition to his knowledge of plants Goodyer knew enough Greek to translate the two works of Theophrastus, "De plantis" and "De causis plantarum"; of the former we have now an English version by Sir Arthur Hort in the Loeb Library, but the latter has never been printed in our language. Later, he began copying out the Greek text of the "Materia medica" of Dioscorides and to interline it with an English translation.

Nearly half of Mr. Gunther's volume is devoted to "Notes on contemporary botanists, mostly from Goodyer's Books and Papers." We thus become acquainted with his relations with other botanists, several of whom are unfamiliar, while many more are only slightly known to us, and from these pages we gain much. Among these may be mentioned William Coys of Stubbers in Essex; William How, the author of the first British flora and editor of Lobel's last issued work; John Parkinson, the last of the herbalists; the Rev. Walter Stonehouse, and William Browne of Magdalen, to whom his college probably owed the bequest by Goodyer of his books and papers, the foundation of the volume now under discussion.

The limits of this notice forbid any further dwelling on the contents of a volume of the greatest value and a treasure-house to everybody who is interested in British botany.

One unimportant error may be mentioned as occurring on page 84, namely, that of Mattioli's Commentaries on the "Materia medica" of Dioscorides: seventeen editions were said to be published; the actual number was nearly seventy, for Saccardo speaks of sixty at least, and he was not acquainted with all. But we close the volume with feelings of gratitude to the author; his zeal and devotion have added greatly to our appreciation of the Hampshire and Sussex botanist, whose record does so much to redeem the time when he lived from being considered a barren period for the science of botany.

B. D. J.

Functions of Industrial Research.

Research in Industry: The Basis of Economic Progress.

By A. P. M. Fleming and J. G. Pearce. (Pitman's Industrial Administration Series.) Pp. xvi+244. (London: Sir I. Pitman and Sons, Ltd., 1922.) 10s. 6d. net.

THE case for research and education as the best means of assuring progress in industry is most ably demonstrated by Messrs. Fleming and Pearce, who are well known for their association in directing the Research Department of the Metropolitan-Vickers Electrical Co. Ltd., of Manchester. The book covers a very wide field, and should be read by all who are engaged either in scientific work or in industrial administration. The social aspects of the subject are kept well in view and the great importance which the scientific study of the human factor in industry is destined to take in the resettlement of industry is duly recognised, although the work of the Industrial Fatigue Board receives less attention than it deserves.

The various types of research laboratories and methods of research organisation, including the comparatively new co-operative method illustrated in British Research Associations, are dealt with in detail. Considerable space is devoted to the planning, equipment, and staffing of works research laboratories, and the financial aspect is dealt with more fully than in any previous publication.

An interesting chapter deals with the collection and distribution of information for research and industrial purposes. The problem of making an intelligence department of a works library efficiently productive might with advantage have been elaborated further, in view of the authors' special experience. Although there is need for greater co-ordination among the many agencies for collecting and abstracting scientific information, the necessity for its distribution to and absorption by the industries is infinitely more important. The British scientific worker is, perhaps, less thorough than his fellow-workers abroad in surveying the field of previous work on the problem he is investigating, and, indeed, excessive zeal in this direction may tend to limit originality and initiative. In industry, however, numerous examples of wasted opportunity and moribund conditions could be quoted which are due largely to ignorance of similar industrial practice in other countries. The awakening of inquisitiveness as to foreign methods of manufacture might prove the starting-point for a still greater receptivity among employers, and from this the step to a conviction of the desirability of actual original research is relatively small, as American experience has abundantly shown. Europe, in fact, in competing